

AN ARCHAEOLOGICAL REVIEW OF

MAUNAWILI VALLEY, KAILUA,
KO`OLAUPOKO, O`AHU
TMK; 4-02-10:01

KA`AU CRATER, PALOLO VALLEY,
WAIKIKI, O`AHU
TMK: 3-4-22: 06

KOKO CRATER, MAUNALUA,
KONA, O`AHU
TMK; 3-9-12:01

HECO PROPOSED PUMPED STORAGE
HYDROELECTRIC POWER PLANT

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INTRODUCTION

This report is for a preliminary study to determine the feasibility of installing a pumped storage hydroelectric power plant on the island of O`ahu. The study is being jointly sponsored by the Hawaiian Electric Company (HECO), the State Department of Business, Economic Development and Tourism (DBEDT) and the Department of Land and Natural Resources (DLNR). The Division of Water and Land Development (DOWALD) contacted the State Historic Preservation Division (SHPD) to do a literature search and archaeological fieldchecks of the proposed sites.

The proposed locations are Ka`au Crater in Palolo Valley with an associated facility in Maunawili Valley (Fig. 1). The two sites are separated by the Ko`olau Mountains and are approximately 1.14 mile (1.83km) apart, centerpoint-to-centerpoint. The other location is Koko Crater with the outlet structure to be moved just south of the Sewage Disposal (Fig. 1).

Ka`au Crater is tax map designation 3-04-22:06; Maunawili Valley, 4-02-10: 01; Koko Crater, 3-09-12:01.

The proposed site location in Maunawili Valley was visited by Carol Kawach, SHPD inter-agency archaeologist, Lou Lopez, project manager of Okahara and Associates, and George Krasnick of GS Associates on 10 November 1993. Ms. Kawachi and Holly McEldowney of SHPD Culture and History Branch, were guided to Ka`au Crater by Ted Strand, a Palolo resident, on 16 December 1993. On 17 December 1993, Ms Kawachi and Mr. Shozo Yuzawa of Electric Power Development Co., Ltd (EPDC International), the engineer subcontracted by the local consulting engineers, Okahara and Associates, did a preliminary survey west of Kalaniana`ole Highway south of the STP. Due to time constraints, the interior of Koko Crater was not visited.

The literature search has been limited to archaeological reports available in the State Historic Preservation Division library. Starting from the general to the specific: Kailua *ahupua`a* is presented first, then Maunawili Valley; Waikiki *ahupua`a*, Palolo Valley, then Ka`au Crater; Maunawili *ahupua`a*, lastly Koko Crater.

I. THE MAUNAWILI PROJECT AREA

Introduction

The proposed project will be located in Maunawili Valley, at the base of the Ko`olau Mountain Range, at the southwestern end of Kailua *ahupua`a*.

A. KAILUA AHUPUA`A

Located on the windward side of O`ahu, Kailua *ahupua`a* extends from the Ko`olau Mountains to the sea, with Kane`ohe to the north and Waimanalo to the south (Fig.2). The many streams that originate in the mountains flow through Maunawili Valley and Kawai Nui Marsh on its way to the sea. Kailua's coastline extends from Lanikai to Mokapu Boulevard (Fig. 2).

Today, Kailua is most densely populated along the coastline. Modern housing developments cover the midsection excluding Kawainui Marsh. Development is moving back into the valleys in form of housing developments and golf courses. The displaced Luluku banana farmers are farthest back in the valley.

Kailua town sits on a sand berm or accretion barrier which changed a once open bay into a lagoon. The work of Athens and Ward (1991) "suggest that the change from an open marine bay to a terrestrial wetland environment had begun prior to any possible impact from the first human settlers and was the long term result of Holocene sea level change" (Erkelens 1993:22). Occupation on the berm began sometime in the late 13th or 14th centuries (Athens 1983:32).

Referencing geomorphologist John C. Kraft, "Eventually, terrigenous sediments and soils . . . created in the Marsh floor an arable landscape that supported agriculture [taro and rice]" until the early 19th century (Allen 1991:5-6). "The pondfields in Kawainui Marsh now lie buried beneath sediments and soils that continue to fill the marsh basin" (Allen 1988:14)

Settlement on the slopes of Kawai Nui Marsh occurred "by at least A.D. 1300 [and] as early as A.D. 770" (Erkelens 1993:56) at least at Kukanono on the southwestern slope. Erkelens's work substantiates the earlier work by Clark (1980) that Hawaiians had settled around Kawainui Marsh by 1000 BP. Occupation was permanent and continuous with various habitation structures amidst small dryland garden plots.

Prehistoric Land Use

Please refer to Cordy (1977), Drigot and Seto (1982), Kelly and Clark (1980), Kelly and Nakamura (1981), and Creed (1992) for a thorough literature and map study of this

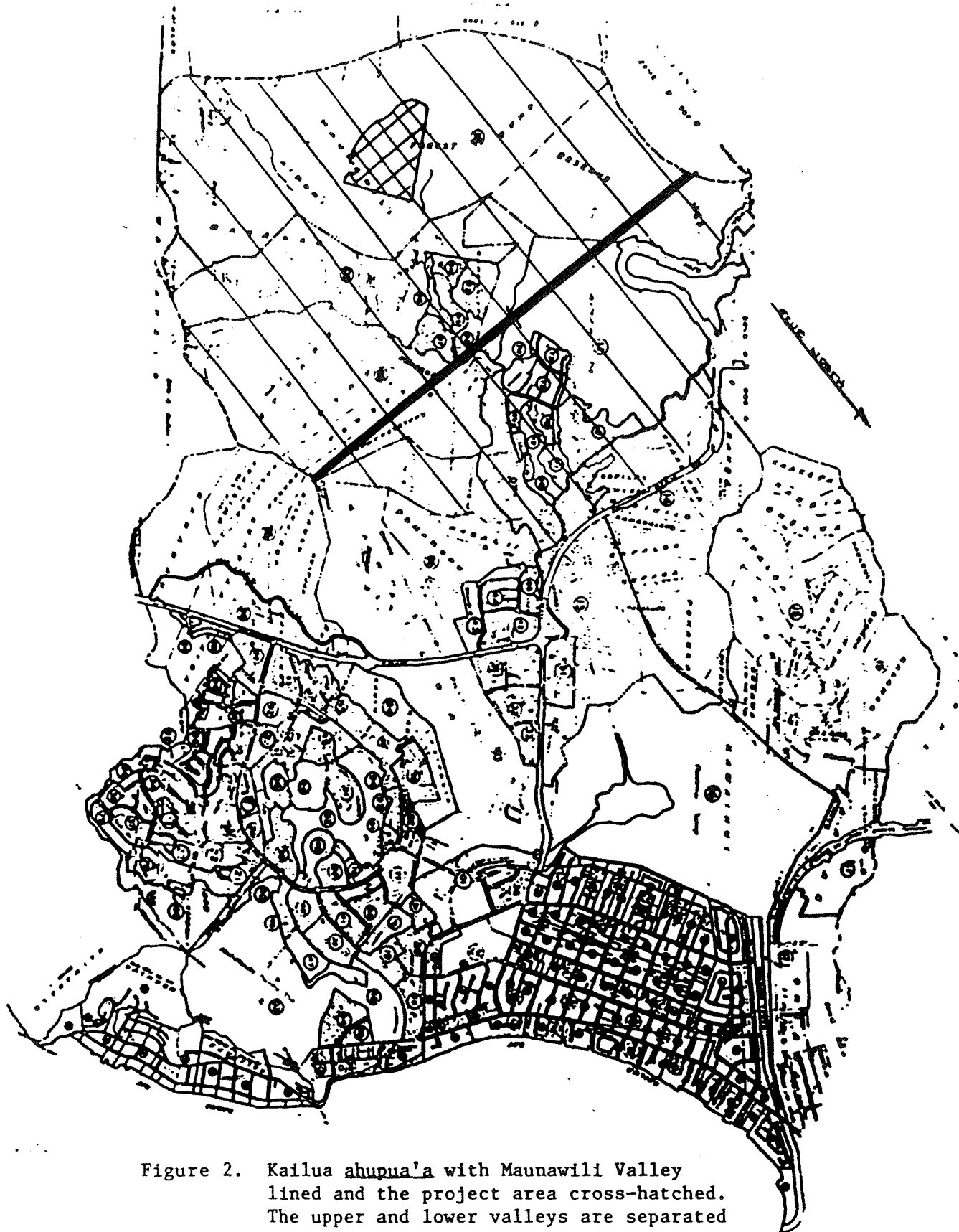


Figure 2. Kailua ahupua'a with Maunawili Valley lined and the project area cross-hatched. The upper and lower valleys are separated by the red line.

area. Kawai Nui Marsh and its surrounding areas to the south, east and west have been quite thoroughly investigated archaeologically as well: (Bordner 1977, 1982; Ewart & Tuggle 1977; Clark 1977, 1980; Cordy 1978; Morgenstein 1978; Dye 1979a & b; Allen-Wheeler 1981; Neller 1982a & b; Athens 1983a & b; Barrera 1984b; Watanabe 1988; Kawachi 1988; Kennedy 1990; Hammatt et al 1990; Athens & Ward 1991; Erkelens 1993).

Kailua *ahupua`a* was traditionally divided into 79 land sections called *`ili* (Office of the Commissioner . . .1929:392-397). This is a large number of *`ili* and a pattern often associated with large *ahupua`a* populations and highly productive lands (pers comm Ross Cordy).

High chiefs who have resided in Kailua included Kakuhihewa, Kualii (Fornander 1969:274-283), Kahekili (Kamakau 1961:138) and Kamehameha I (Sterling & Summers 1978:232). Kakuhihewa had his famous house in what is now known as Coconut Grove (Sterling & Summers 1978:229). Continued chiefly interest in these lands can be seen from land awards during the Great Mahele of 1848. Queen Hazaleleponi Kapukahaili Kalama, consort of Kamehameha III, received Kailua *ahupua`a* as Land Commission Award (LCA) 4452: *apana* 12, (Royal Patent 9783) (Office of the Commissioner . . .1929:2). She shared it with King Kamehameha III and Princess Victoria Kamamalu (Creed 1992:11). Within the *ahupua`a*, smaller land divisions were awarded to 41 high chiefs (Creed 1992:11).

The lands were highly productive. One hundred and forty-eight (148) awards were made to the *maka`ainana* (commoners) (Office of the Commissioners . . .1929: 3, 392-397). Most of these awards included cultivated lands. Irrigated taro fields were located in the valleys at the back of Kawai Nui marsh (Watanabe 1976; Cordy 1977; Neller 1982; Toenjes & Donham 1985), in the marsh (Cordy 1977), and along the edges of Ka`elepulu pond (McAllister 1933:190). Dryland fields were located along the slopes above the marsh (Cordy 1977; Ewart & Tuggle 1977; Clark 1980; Erkelens 1993; Athens 1983b) and in other drier lands (Allen 1986, 1987b & c, 1988; Williams 1988). Additionally, Kawai Nui and Ka`elepulu were large fishponds (Kamakau 1961:457)).

In the 1840s, houses were present along the shore, in the Pohakupu-Kukanono slope near Maunawili (Cordy 1977:24), at the front of Kapaa valley (Creed 1992), and around Kaelepulu pond (Creed 1992). Archaeological research has found scant evidence of permanent habitation in the upper valleys.

Seven heiau were known in Kailua (McAllister 1933:182-191). Around the perimeters of Kawai Nui Marsh are at least three heiau. Two of them are quite large (Ulu Po, Pahukini). McAllister recorded Holomakani west of Ulumawao Ridge but its exact location is unknown (1933:182).

Other heiau in Kailua were Kukuipilau, Alaala, Kanahau and Kaikipuipui. Kukuipilau, Kanahau and Kaikipuipui were on the southern and southwestern slopes of Olomana Ridge. Alaala, on the coast at Alaala Point, was where "the ceremonies attending the royal birth of Kualii, . . . , were performed" (Thrum 1916:87). Kanahau is where "Hiiaka, stopping on her way to Kauai, was for once satiated with taro tops" (McAllister 1933:190). Kaikipuipui heiau, renovated by Kamehameha I, once "crowned the small hill near the present [1933] road on the dividing line between Kailua and Waimanalo " (McAllister 1933:190).

Allen theorizes that the floodplains, beaches, protected bays, forests and stream valleys of Kailua may have been one of the earliest areas settled (A.D. 400-600) (1991:2). Early dates have come from habitation and agricultural sites along the slopes of Kawai Nui Marsh (Clark 1980; Erkelens 1993), and from Maunawili Valley itself. (Allen 1989).

Even in the post-Contact period, Kailua continued its high-valued status. High chiefs and high-status non-Hawaiians bought or leased land and lived here. There were rich food sources from the land and the sea.

B. MAUNAWILI VALLEY

For this paper, the area of Maunawili inland of Kalanianaʻole Highway back to the Koʻolau Range, is considered Maunawili Valley (Fig. 3). Maunawili is divided into a lower and upper valley. The lower valley extends inland from Kalanianaʻole Highway, includes Maunawili Marsh (now an open pasture), and extends up to where Omaʻo Stream meets Maunawili Stream or at the junction of Aloha Oe Drive and Maunawili Road. The lower valley is a relatively flat area dominated by Maunawili Estates housing development. Here the valley floor is ca. 2500 feet (762m) wide.

The upper valley extends inland from the junction of Aloha Oe Drive and Maunawili Road in Maunawili Estates. Beyond this modern housing development, there are very few homes amidst the hills and stream valleys. The proposed project area is in the upper valley just inland of the Hawaiian Sugar Planters Association experiment station (Fig. 3).

Maunawili `ili is nestled between Ainoni `ili on the east and Omaʻo `ili on the west (Fig. 4). Their combined boundaries to the top of the Koʻolau Range form Maunawili Valley, "really a series of valleys carved by all the tributaries [Omaʻo, Ainoni, Makawao, Olomana] to Maunawili Stream" (Allen 1988:14). Mean annual rainfall in the back of the valley is 118 inches (3,000mm) (Giambelluca et al 1986:138).

The project area is at the base of the Koʻolau Mountain Range at the back of Maunawili Valley, covering approximately 45 acres (18.2ha), and cutting across four tributaries to Maunawili Stream (Fig. 3), approximately 6 miles (10km) from the coast.

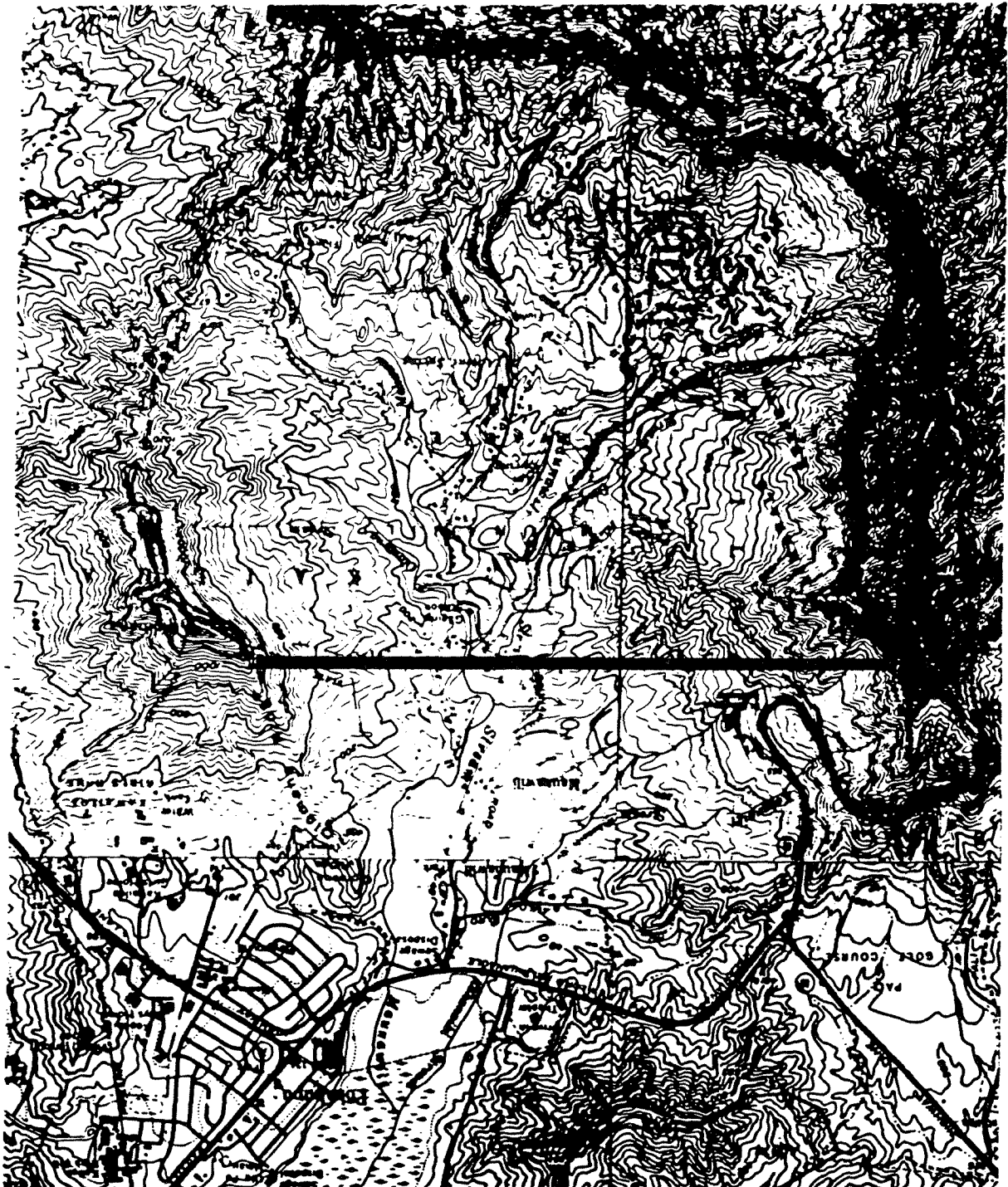


Figure 3. The traditional 'ili of Maunawili is outlined in green. The project area is in yellow. The upper and lower valleys are separated by the red line.

This area was formerly Forest Reserve land which was reforested during the 1920s by the Territory of Hawaii (Williams 1988:8). Small truck farms were also here between the late 1920s to the mid 1960s, growing banana, papaya, ginger and sweet potatoes (Williams 1988:12). Vegetation, therefore, varies from areas reforested to those once under cultivation.

A ditch and tunnel system constructed since the 1890s transports water from Maunawili to drier Waimanalo (Stearns and Vaksvik 1935:411-415).

Prehistoric Land Use

Only three small Land Commission Awards were made in Maunawili during the Great Mahele of 1848 (Office of the Commissioner . . . 1929:396): The Foreign Testimony given for Kuheleloa (LCA 4248-B) described two parcels: one consisted of 14 taro patches bounded on two sides by upland and the other two sides by the lands of Kaiole and Waipunalei (14:206). His houselot was bounded on all sides by upland. Pohuli's (LCA 6164) claim in the Native Register (5:251) describe only a *mo`o*, and a *kula*. This information suggests wet and dryland agriculture. Mokulehua's claim (11294) was in neither the Registers or the Testimonies. It is not known exactly where these *kuleana* were located. Wall's 1894 map (Reg Map 2050) does not show any *kuleana* in Maunawili `ili.

During the early post-Contact period, the following crops were grown in Maunawili in addition to taro: breadfruit, sweet potatoes, gourds, arrowroot and fruit (Native Register and Testimonies).

Since 1930, approximately twenty archaeological surveys have been reported in Maunawili Valley. Only two were done in the lower valley. The pattern in the lower valley was pondfields on the valley floor with dryland agriculture and habitation sites on the slopes (Allen 1986, 1987a, 1988).

Forty-percent of the proposed project area has already undergone archaeological inventory survey (William 1988; Mills & Williams 1991) in preparation for the relocation of the Luluku banana farmers displaced by the construction of H-3 (Fig. 4). Table 1 describes the sites in the project area. Most of the sites recorded in the narrow upper valleys were associated with agriculture, both irrigated and dryland (Table 2). The pondfields or irrigated systems, near streams or springs, ranged from very small systems across rivulets to a large complex of terraces on both sides of Maunawili Stream. Dryland agricultural fields were in the form of terraces and mounds (Allen 1987b &c, 1988; Williams 1988). In some cases, both irrigated and non-irrigated fields were in the same complex (Allen 1987b, 1988). Kukapoki heiau was the only heiau identified and it overlooked a large complex of terraces along Maunawili stream, suggesting the heiau was probably an agricultural heiau.

Dating indicates "Extensive terracing of hillslope lands became standard practice . . . in Maunawili by A.D. 1300-1400" (Allen 1991:11) and irrigated taro or valley flats dated

BANANA FARMERS' RELOCATION
PROJECT AREA,
UPPER MAUNAWILI, O'AHU

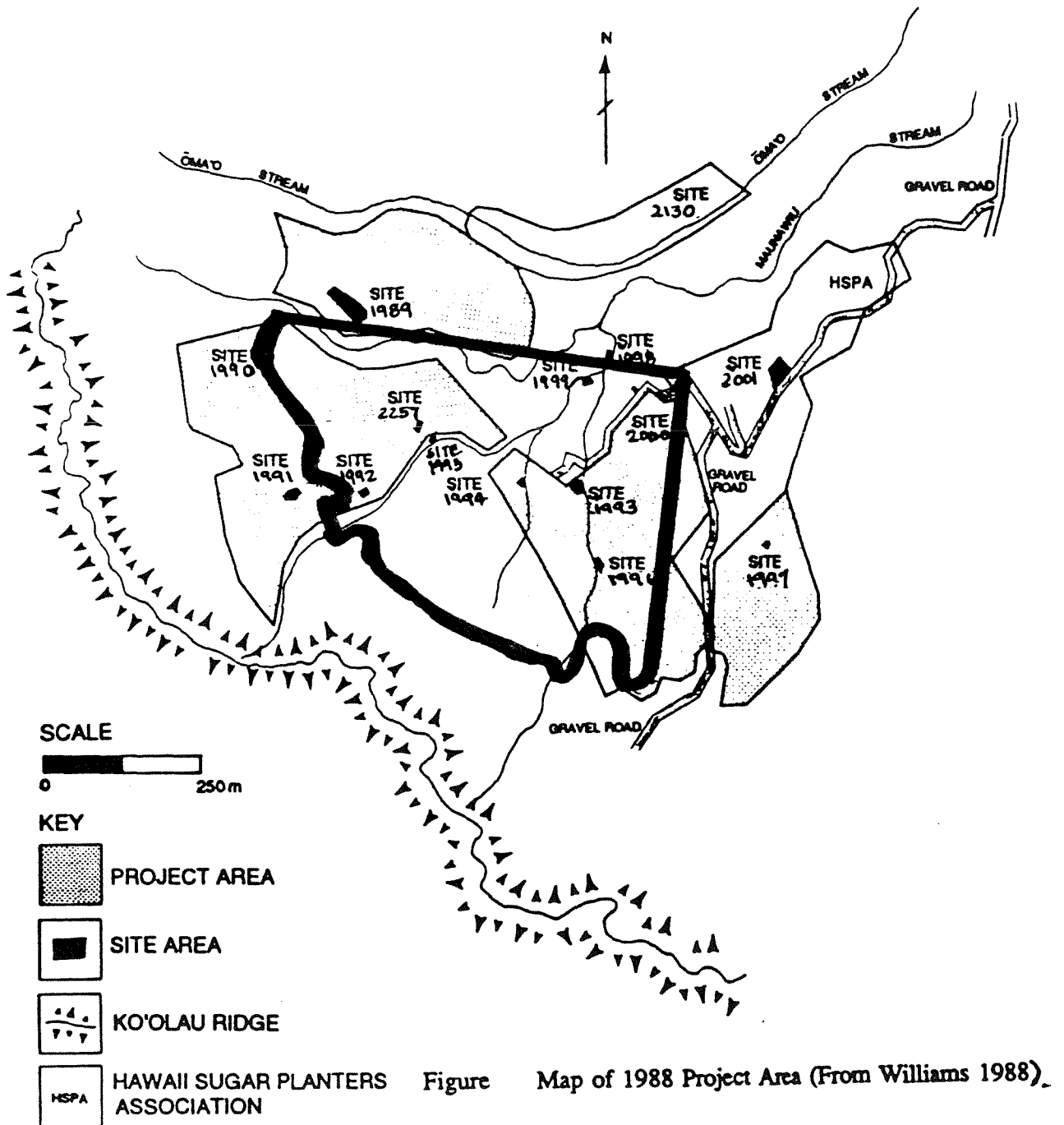


Figure 4. Proposed project area outlined in red. Shaded areas surveyed by Williams (1988). Taken from Williams 1988.

Table 1. Archaeological Sites in the Project Area

State #	Description	Location	Contact		Reference
			Pre-	Post-	
1989	60-70 rock mounds	upper valley, N of Maunawili			Wms 1988
1990	split-level terrace, 18 mounds: dryland ag	upper valley, S of Maunawili		x	Wms 1988
1991	30 mounds, 6 terraces, 7 other	upper valley, uppermost			Wms 1988
1992	4 mounds,alignment	upper valley, along stream	AD 1260- 1420		Wms 1988
1993	cut banks, stone alignment	road junction' outside		x	Wms 1988
1994	1 terrace facing	marshy flat			Wms 1988
1995	housesite	upper valley		x	Wms 1988
1996	6 irrigated terraces	upper valley	AD 1270- 1430	x	Wms 1988
1997	3 terrace remnants	Riley type 1, W of Ainoni			Wms 1988
1998	ag complex: retaining wall terrace remnant rock mound	upper valley, W of Ainoni	x	x	Wms 1988
1999	pecked inscription	Maunawili Falls, outside		x	Wms 1988
2000	irrigated terraces	outside	x		Wms 1988
2001	privy	outside		x	Wms 1988
2257	alignments	HSPA bananas outside		x	Wms 1988

Table 2. Archaeological Sites in the Upper Maunawili Valley

Survey	Survey Level		Land Use	
	I	M	pre-contact	post-contact
McAllister 1930	x		religious	
Allen 1986	x	x	habitation, dryland agricultural complex	habitation
Allen 1987a	x	x	dryland agriculture, lithic wkshp, perm hab (390 \pm 100 BP)	temp hab
Allen 1987b	x	x	irrigated & dryland ag, prob perm hab (AD 1400-1500)	perm hab, road, charcoal preparation pit, charcoal kiln
Allen 1988	x	x	religious, irrigated terraces	coffee mill, pig-pen
Williams 1988; Mills & Williams 1992	x		dryland ag (mounds, terraces) complex; pondfield terraces	dryland ag complex; pondfield terraces
Hammatt & Shideler 1991	x		dryland ag terraces; temp hab; irrigated terraces	road, charcoal kiln
Allen 1992	x		lithic manufacture, temp/perm hab	

KEY: I Inventory
 M Mitigation

back to A.D. 1200-1400 (Mills & Williams 1992:89-91; Cordy in press) It is suggested, however, that Maunawili may have been "experiencing widespread agriculture earlier than the limited data suggest" (Mills & Williams 1992:98).

Williams cautions against depending solely on surface features for locating pre-Contact sites in Windward areas (Mills & Williams 1992:94). An important subsurface habitation site was uncovered only after the vegetation had been removed by mechanical means. Based on the evidence of subsurface imu and lithic scatters, Mills and Williams suggest a model of small temporary habitations associated with dryland agriculture in the upper valley (1992:96)

Of the two pre-contact habitation sites found in the lower end of the upper valley, one was permanent, the other was temporary. All other (5) house sites were of the historic period. Allen notes that this paucity of pre-contact habitation sites in the intensively cultivated areas is similar to that of Kane`ohe to the north. The paucity of pre-Contact habitation sites suggests that the well-watered backlands were used almost exclusively for cultivation.

There is no indication of high-status chiefly presence in the upper valley. It is likely that only commoners farmed and worked the fields.

Predictive Site Pattern

Should planning for this project proceed, sixty percent of the project area will need an archaeological inventory survey (non-shaded areas of Figure 4). The types of sites likely to be found include agricultural sites with pondfield terracing in the stream valleys, and dryland terraces and mounds in the drier areas, along with lithic and charcoal manufacturing sites and subsurface habitation sites.

II. The Ka`au Crater Project Area

Introduction

The proposed project element in Ka`au Crater is located in Palolo *a`ili* in the *ahupua`a* of Waikiki in the traditional district of Kona (Fig. 5). Ka`au Crater is located on the south side of the Ko`olau Mountain Range across from Maunawili Valley. Ka`au Crater, only about a mile (1.6km) away from the nearest home, is accessed by a trail on the ridge or from Wai`oma`o Stream. It is approximately five miles (8km) northeast of Diamond Head.

This section of the paper first looks briefly at the *ahupua`a* settlement patterns and then at the patterns of the project area at Ka`au Crater.

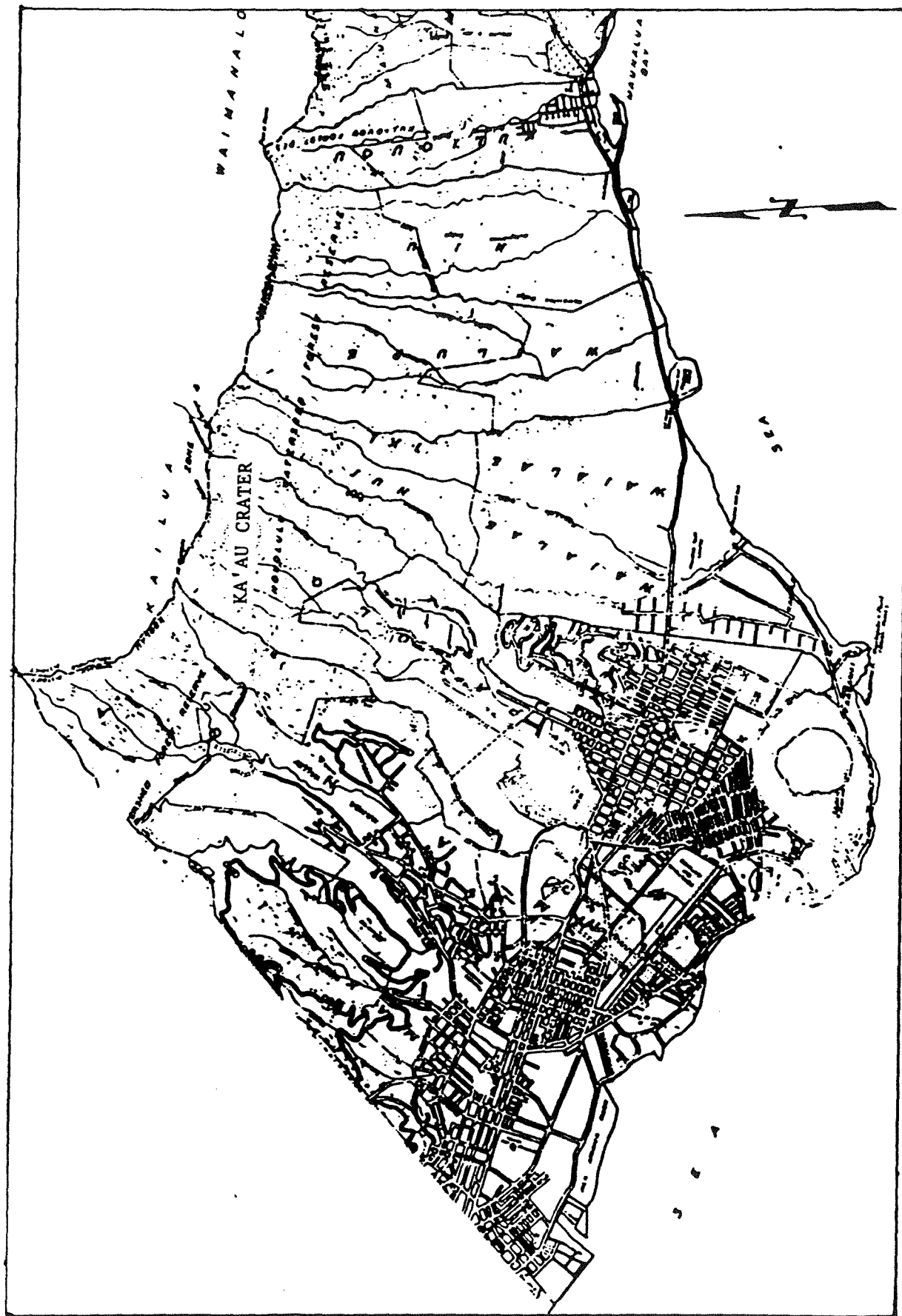


Figure 5. Waikiki ahupua'a from Manoa to Kuli'ou'ou. Ka'au Crater is in back of Palolo 'ili.

A. WAIKIKI AHUPUA`A

Waikiki *ahupua`a* traditionally extended from Round Top to the ridge east of Kuli`ou`ou Valley (Hawaiian Studies . . . 1987). Within the *ahupua`a* are the valleys of Manoa, Palolo, Wai`alae, Wailupe, Niu and Kuli`oul`ou (Fig. 5). The area today known as Waikiki is actually in Manoa `ili.

Environment

Waikiki *ahupua`a* is made up of two major valleys (Manoa, Palolo) and seven minor ones (Pia, Kupaua, Kuli`ou`ou, Wai`alae, Kapakahi, Wailupe, Kulu`i) and seven ridges (Round Top, Wa`ahila, Kalaepohaku, Mau`umae, Wiliwili, Hawaii Loa, Kulepeamo). It includes Ka`au and Diamond Head Crater.

It has rainforests, sandy beaches, coastal plains, high ridges and open valleys. Manoa and Palolo have permanent streams. The smaller valleys have at least one stream, albeit, an intermittent one. East of Wai`alae, the valleys and ridges do not extend inland more than three miles (4.8km) from the coast, and range from 0.3 to 2 miles (0.5 to 4.8km) width at the coast.

Settlement Patterns of the `Ili

Waikiki *ahupua`a* encompassed several `ili land units: Manoa, Palolo, Wai`alae, Wailupe, Niu and Kuli`ou`ou. Information on the various `ili will be uneven due to the limited archaeological and historical information available.

In the following, I will use the term Waikiki in its modern usage, i.e., the coastal area between the Ala Wai Canal on the west extending to Kapahulu Avenue on the east, bounded by Ala Wai Canal on the north and by the sea on the south.

Manoa `Ili

Manoa `ili is made up of Manoa valley (upper Manoa) and Waikiki with Mo`ili`ili in between. There has basically been no archaeology in Mo`ili`ili or McCully.

In Manoa Valley, `Aihualama, Waihi, Lua`alaea, Naniu`apo, Wa`aloa and Waiakeakua Streams come together at Waakaua Street and become Manoa Stream. Manoa Stream flows down the east side of the valley to meet Palolo Stream just above Wai`alae Avenue before flowing down the Manoa-Palolo Drainage Canal, to Ala Wai Canal and to the sea.

The Mahele land records document taro pondfields, dryland taro, sweet potatoes, house lots, and *kula* in Manoa (Grune 1992:Fig 8). The pondfields covered the valley floor along the streams with sweet potatoes growing on the nearby slopes. In the 1930s there was still about 100 terraces of wetland taro still planted (Handy & Handy 1972:480).

Today, only scant evidence such as agricultural terraces and mounds remain of this once extensive cultivation (Kawachi 1988; Smith 1988). Close to the mouth of the valley, excavation in *Kapapa Lo`i o Kanewai*, uncovered buried *`auwai* (irrigation ditches) (Buchard 1992).

Houselots were located on dry areas near the fields (Grune 1992).

Burial remains have been found in hillside caves and in burial pits on the valley floor (Bath 1989; Smith & Kawachi 1989, Bath & Kawachi 1990; Hammatt & Shideler 1991, Kawachi 1991; Dagher 1993).

From Mo`ili`ili to the shore at Waikiki was a huge taro pondfield system watered by canals leading off of Palolo and Manoa streams (cf Vancouver 1801; McAllister 1933; Sterling & Summers 1978; Nakamura 1979; Grune 1992). The seaward part of this system led into fishponds (Handy 1971: 74-76). In 1788-89, ". . . some had fish, others turtle" (Meares in McAllister 1933:76). "Most of these fish belong to the chiefs, and are caught as wanted. The ponds are several hundred in number and are the resort of wild ducks and other water fowl" (Bloxam in McAllister 1933:76). In 1901, there still were "14 fishponds in use at Kalia and Waikiki . . . those at Waikiki were fresh-water ponds" (Cobb in McAllister 1933:76).

On the coastal sand berm many house sites were present (cf Grune 1992) and associated burials (cf Davis 1991). Coastal Waikiki was one of the ruling centers of O`ahu, from the time of Ma`ilikukahi (ca 15th or 16th century) to Kamehameha (ca. 1805) (cf Fornander 1969 II:89; Kamakau 1961, 1992). Thus many features of the court were present - from gaming areas to the large sacrificial heiau of Papaenena and Apuakehau (McAllister 1933:71-76).

The readers are directed to Davis's (1991) work in which he summarizes archaeological investigations in Waikiki over the past 10 years. Subsurface excavations have unearthed walls of buried fishponds, prehistoric and early historic habitation deposits, and human and animal burials (Neller 1980, 1981, 1984; Davis 1981, 1984, 1989a & b, 1991; Griffin 1987; Simons 1988; Bath & Kawachi 1989; Riford 1989; Rosendahl 1989a & b; Kennedy 1991; Hurlbett, Carter & Goodfellow 1992; Streck 1992; Pietruszewsky 1992a & b).

On the Waikiki side and at the base of Diamond Head, Papaenaena heiau (site 58), a large *po`okanaka* heiau, used by Kamehameha I in 1804, was in ruins by 1822 and totally demolished in 1856 by Kanaina (McAllister 1933:74). A very small remnant was seen in 1989 by the author. There were also two other *pookanaka* class heiau (Apuakehau Kapua), and two others of unknown class (Kupalaha near Papaenaena and Halekumukaaha), which McAllister was unable to locate (1933:76-78).

Palolo `ili

Palolo `ili includes Palolo Valley, Kaimuki, Kapahulu, and Diamond Head. Pukele and Wai`oma`o Streams meet at Palolo Elementary School just above Kiwila Street and become Palolo Stream. Palolo Stream flows through the middle of the valley before it turns west to meet Manoa Stream.

The Indices of Awards . . . (1929) list thirty (30) Mahele awards granted in Palolo. An 1881 monarchy map (Reg Map 906) shows 69 land parcels included in these awards document and indicate an average of 12.2 fields per individual. All of the small awards were inland of Paku`i Street between what is now Palolo Avenue on the west and 10th Avenue on the east. There were some farther inland along Wai`oma`o Stream up to about Halelaau Place. In 1930, some of these taro terraces were still evident (Handy 1971:74).

Only seven awardees claimedouselots (Luahiwa LCA 1646; Keaka LCA 1653; Upepe LCA 1656; Kawaihae LCA 1761; Paele LCA 1842; Lioe LCA 1845; Mahana LCA 1896). Only two houses are shown on the 1881 map (Reg Map 906) and they are mid-valley.

Palolo Valley has had only limited archaeology. A *pookanaka* class heiau, Maumae heiau, was described by Thrum as being in Palolo (McAllister 1933:196). Mauoki heiau (site 62), as described by Thrum, was at the foot of the ridge between Manoa and Palolo (McAllister 1933:78). A heiau was said to be located where the Diamond Head lighthouse now stands (McAllister 1933:74).

Burials in caves along the slopes have been found in Palolo (Kennedy 1987; Kawachi 1989). On the coast by Kapiolani Park and continuing eastward, human remains have been found (Emerson 1902; Neller 1984; Bowen 1963; Cleghorn 1933; Dagher 1993; Dega & Kennedy 1993) all the way to Diamond Head beach park. The sewage project along Diamond Head road just inland of the lighthouse uncovered historical artifacts and charcoal (Mullins et al 1993).

Wai`alae `ili

Wai`alae is named for a spring which "supplied water for the chiefs from olden times" (Pukui et al 1976:220).

The Mahele land records document that Wai`alae iki was awarded to Abner Paki, father of Bernice Pauahi Bishop (Office of the Commissioners . . . 1929:23).

According to Nagaoka, there were both taro pondfields and dryland taro in Wai`alae `ili (1985:11). The broad coastal flats were also planted with hala, coconut, orange, coffee, breadfruit and kou trees, dotted with fishponds and saltponds/bed (Bishop Estate Map, No. 718B, 1920 in Nagaoka 1985).. Of twenty-five awardees, 17 claimedouselots, mainly along the coast (Nagaoka 1985:11-14).

There was a very large heiau, Kaunua Kahekiki, located on top of the ridge which divides Wailupe and Waialae (McAllister 1933:71).

Burials have been found along the sandy shoreline (Griffin 1987; Bath 1988, 1989; Kawachi 1989).

Wailupe `Ili

Wailupe's coastal plain at the mouth of the valley is known today as `Aina Haina (Hind's Land), "named for Robert Hind, who started the Hind-Clarke Dairy there in 1924" (Pukui et al 1981:7).

According to the Mahele land records, there were house lots mostly along the coast, *kula*, a taro pondfield, fishponds, plantings of gourds, orange, coconut, hala trees, sweet potatoes and [pili] grass on the coastal plain (Ogata 1992:Appendix I).

Wailupe peninsula was once a fishpond before it got filled in and turned into a residential neighborhood.

Burial caves and pit burials have been found near the shoreline (Sterling & Summers 1978: 71; Kawachi 1991, Ogata 1992).

A *pookanaka* class heiau, Kawaouha, not located by McAllister (1933:71) was thought to have been on the west ridge of the `ili (Ogata 1992:15).

Niu `Ili

Niu Valley is actually two valleys formed by the joining of Kupaua and Pia Streams at the front of Kulepeamoa Ridge. There is no listing for Niu in the Mahele records. Following the pattern of similar valleys, the coast was probably where most inhabitants lived.

Handy thought "the marshy land on the flats above the highway" where the streams met might once have had taro terraces (1940:74).

Kamehameha I once had a summer home here in Niu and Kupapa fishpond was once a part of his 2,446 acre estate (Sterling & Summers 1978:273). Kupapa Fishpond was already filled in when seen by McAllister in 1933 and today is simply known as Niu peninsula or beach.

At the front end of the ridge was Kulepeamoa, a large stepped- terrace heiau (McAllister 1933:70).

Burials have been found in caves and on the coastal plain (Erkelens 1992).

Kuli`ou`ou `ili

Kuli`ou`ou, the easternmost `ili in Waikiki *ahupua`a*, has its stream flowing on the east side of the valley. There is no listing for Kuli`ou`ou in the Mahele records. As with similar valleys in this *ahupua`a*, it is likely that the main body of habitation was on the coast.

Paiko Lagoon may once have been a fishpond.

Only a corner of a large terrace and old coral pieces were all that McAllister found of what may have been a large heiau on the western side of Kuli`ou`ou `ili (1933:70).

Three rock shelters (Makanaiolu, Kawekiu, Kuli`ou`ou) at the front of the valley have been excavated (Emory & Sinoto 1961). The last was believed to have been first occupied about 1000 years ago (Emory & Sinoto 1961).

Kuli`ou`ou was where Kamehameha III "retired with his court for the summer." There was `Elelupe pool which "no one but the king dared touch or pollute that water" (Takemoto et al 1975:23-24).

Summary

The valley floors of both Palolo and Manoa Valleys were once extensively cultivated in taro pondfields. The streams from both valleys met and watered the large pondfield system and fishponds between Mo`ili`ili and Waikiki. From Wai`alaie to Kuli`ou`ou, there were only intermittent streams. The agricultural pattern was mainly dryland agricultural on the coastal plains with taro pondfields along the flowing streams. Each `ili had a fishpond. Some had terraces but what specific crop was being cultivated is unknown. Dryland taro was cultivated where there was sufficient rainfall. Sweet potatoes and other crops were also cultivated on the broad coastal plain.

Palolo and Manoa `ili held large populations, with many on the shore and others scattered inland. The numbers of awards and early census data indicate the larger populations of these `ili. The small valleys to the east seem to have had much smaller populations based on Mahele data with most living on the shore.

The shore of Waikiki was a royal residential center from the 15th and 16th century to the early 19th century. The *ali`i* lived on the coast with large *pookanaka* class heiau on the slopes of Diamond Head and on the shore. The smaller valleys to the east may have had high-ranking chiefs and overlords as residents for each had a large heiau and a fishpond. In turn, this pattern suggests that these small `ili may have once been *ahupua`a* themselves.

Predictive Site Patterns

The settlement pattern for the *ahupua`a* would be habitation, fishpond and saltpond remains along the shore with terraces along the streams and sweet potatoe mounds scattered on the coastal plain. ,

III. The Project Area at Ka`au Crater

Introduction

Ka`au Crater is located in the back of Palolo Valley, in Palolo `ili. Palolo Valley extends inland from Wai`alae Avenue back up to the mountain ridge. Mount Olympus and Kainawaauiika are the boundary peaks along the mountain range. Ka`au Crater is situated approximately midway between the two peaks and midway between the origin points of Pukele and Wai`oma`o Streams.

Environment

The crater is "almost always in the clouds, and hence derives much of its water from fog drip as well as rainfall" (Shallenberger 1977:230). The annual rainfall amounts to 100 to 450 inches [2540 to 11430mm] (Foote et al 1972:27).

"The flat bog on the crater floor is densely vegetated with grasses, bulrush, hau, ohia, strawberry guava and other shrubs. The crater floor is nearly 1500 feet [457m] across, but less than two percent of the bog was actually open water at the time of the survey [17 August 1977]" (Shallenberger 1977:230). "In these areas the water table is at or near the surface. . . ." (Foote et al 1972:27).

The following was taken from a wetlands and wetlands vegetation study done in 1977:

"The most extreme form of disturbance occurred soon after 1900 when Honolulu hydrologists built an earthen dam at the crater's only outlet, in the hopes of creating a large reservoir for city water supply. This dam, located at the northeastern corner of the crater, caused extensive flooding and destruction of native forest (Andrews 1909). Within a few years, however, the dam had partially broken and most of the reservoir waters had leaked out" (Elliott and Hall 1977:112).

Historic Site Information

The crater itself is clearly a traditional cultural place. The crater was supposedly hollowed out by Maui's fishhook after freeing itself from the boulder Pohaku o Kaua`i (Sterling & Summers 1978:277). Another legend tells of a supernatural rooster, Kaau-helu-moa, who in a fight with Kamapuaa, fell into and died in the spring. The spring is now named Kaau-helu-moa. The water is suppose to appear red from his blood (Sterling and Summers 1978:277). Mr. Strand, our guide, did note that the water

flowing out of the crater is red. Informants told him that the crater mud had healing powers. Other accounts state "This was once the site of a natural lake, said by the Hawaiians to be unfathomable" (Nakuina 1905). "Fish were raised [in the lake] for the ancient valley chiefs" (Elliott and Hall 1977:112).

No archaeological survey has been done in the crater although McAllister did record it in 1933 (1933:71). It does not appear, however, that he actually saw it.

The following was told Mr. Strand by a Mr. Horace Akamine, now deceased, who was once a Revenue agent. The crater slopes had once been entirely planted in ti for the making of *okolehao* during Prohibition. Remnants of this activity in form of corrugated iron, bottles, tin cans, and large pits (*imu*) have been observed by Mr. Strand. However, he has never seen rock walls or structures which might be associated with earlier Hawaiian use of the crater.

Ka`au Crater is included in LCA 5931:4, awarded to Iona (Jonah) Pehu, an officer to Kamehameha prior to 1812 (Ii 1959:121) and servant of Liholiho (Probate 1095 1st CC; 1851), who became the land agent for Honolulu under Kuakini (Kamakau 1961:303).

Summary

There is no archaeological information on the crater so an archaeological inventory survey would be needed for planning. It is not likely that habitation or agricultural remains would be found on the floor of Ka`au Crater, which is presently a marsh.

Oral accounts clearly show that the crater and its spring are traditional cultural places. Both would be significant for their traditional cultural significance. This fact might be a constraint for the project.

IV. The Koko Crater Project Area

A. MAUNALUA

Today, Maunalua is the easternmost area in Honolulu District (Fig. 6) but traditionally, it was a part of Ko`olaupoko District, an *`ili* of Waimanalo *ahupua`a*. The modern name of Maunalua is Hawaii Kai, so named by Henry J. Kaiser who developed the area in the 1960s.

Maunalua is roughly triangular shaped with Koko Crater, Makapu`u Point and Pu`u O Kona as apexes. It is approximately 5 miles (8km) on the southeastern shore, 4.5 miles ((7.2km) on its western side and 4.7 miles (7.6km) along the Ko`olau Range.

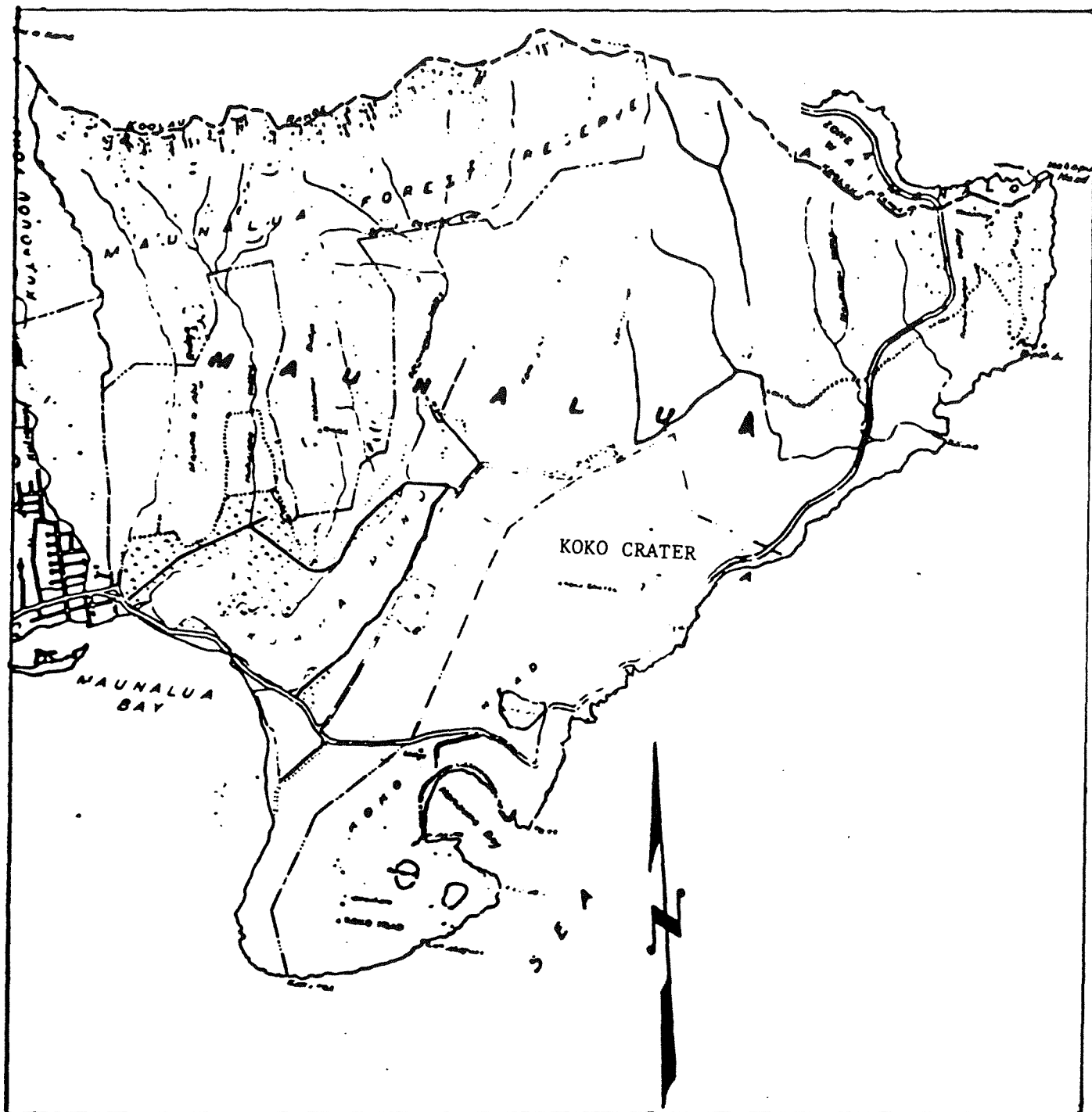


Figure 6. Maunalua ahupua'a. Koko Crater is on the east coast.

Environment

Maunalua includes Kaaiakei, Haha`ione, Kamilonui, Kamiloiki, Kalama Valleys and Mauna o Ahi, Kaluanui, and Kamehame Ridges (Fig. 5). Koko Crater is located at the eastern end of Maunalua with Koko Head or Mookua o Kaneapua and Hanauma Bay to the south. Koko Crater was known to the Hawaiians as Kohelepelepe.

The intermittent streams that flow out of Kaaiakei, Haha`ione, Kamilonui Valleys and Kaluanui Ridge all flow into Kuapa Pond. The intermittent streams from Kalama and the unnamed valley to the east appear to flow into a drainage which once reached the sea at Queen's Beach. Rainfall is about 3 to 4 inches (800 to 1000mm) annually (Giambelluca et al 1986:138).

The soils in the area range from exposed rock, sand and fill land, well drained soils, clay loam, extremely stony clay and coral outcrops (Foote et al 1972: maps 67-68.)

Historic Site Information

No *kuleana* were awarded to commoners in Maunalua during the Great Mahele. But in 1855 and 1880, 38 households were living here (Takemoto et al 1975:25).

In 1933, an archaeological inventory survey by McAllister found permanent house sites in the form of surface stone structures or subsurface layers in the sand northeast of Sandy Beach, Wawamalu Beach, on the eastern side of Kalama Valley mouth; at Hahaione Valley mouth, and at Kahauloa Crater (McAllister 1933:59-68). More recently, house sites have been found on Kaluanui ridge (Price-Beggerly & McNeil 1985)

Burials have been found in caves (McAllister 1933:66; Kam 1985; Price-Beggerly & McNeil 1985), on the slopes of Koko Crater and on the sandy shore (Kawachi & Smith 1990).

McAllister recorded only two small heiau in Maunalua: Pahua, a small, agricultural type heiau and Hawea, a terraced and paved structure (1933:65-66). A probable heiau in the back of Hahaione Valley was bulldozed in 1972 (Tuggle 1972).

Extensive sweet potato patches were found on the eastern side of Kalama Valley mouth (McAllister 1933:63-65). Hahaione Valley once had a "complex set of terraces . . ." (Tuggle 1972) but it is not clear what was cultivated here. In 1868, Brigham reported "a small spring issuing near sea level at the head of Hanauma Bay was used for irrigating several taro patches along the shore" (Stearns & Vaksvik 1935:153).

Temporary habitation sites in caves or rock shelters have been found near Makapu`u Head (Kurashina & Sinoto 1984), near Pahua heiau (McAllister 1933:66), Kaluanui Ridge (Solheim & Gorman 1962; Smart & Bayard 1964-65; Price-Beggerly & McNeil

1985) and in Hanauma Bay (Emory & Sinoto 1961). An open site of "temporary multiple use" was recorded on the tip of Kaluanui Ridge (Folk et al 1993:31).

Perhaps the largest subsistence feature of this land is Kuapa Pond, once known as Keahupua-o-Maunalua (McAllister 1933:69). It was a huge pond with a wall, kuapa, built to cut it off from the sea (Takemoto et al 1975:8). In 1851, it was 523 acres in area (Takemoto 1975:10). In 1921, the water area was 301 acres with a swamp land of 125 acres (McAllister 1933:69; Takemoto et al 1975; Sterling & Summers 1978; Kelly et al 1984). "At one time it was the largest [fishpond on O`ahu] and an important source of mullet (Cobb in Kelly et al:1985:1).

Ko`a are shrines built to make fish multiply (Pukui & Elbert 1975:145). Three named *ko`a* were recorded on the west side of Koko Head or Mookua o Kaneapua: Paliālaea and Huanui were for mullet, and Hina was for scad (McAllister 1933:69).

Hanauma Bay, on the east side of Koko Head was "a favorite royal fishing resort" (Sterling & Summers 1978:267), where Queen Kaahumanu and Kamehameha V came, not only to fish but to be entertained by hula dancers and games (Sterling & Summers 1978:267).

Summary

Maunalua is a large land which was extensively developed in the 1960s-1970s into Hawaii Kai, a residential neighborhood. Development has obliterated most of the inland sites but undeveloped coastlines, deep valleys and steep slopes may still yield remnants of past times. Post-Contact land use included sweet potato cultivation and ranching.

Farming in the terraces in the back valleys was probably during the rainy season but the dominant crop appears to have been sweet potatoes planted on the coastal plain and along the slopes. Permanent habitation was probably along the shores of Kuapa Pond and the sea. Fishing and sweet potato cultivation appear to have been the prime activities of the area.

The presence of only three small probable heiau in such a large area and the lack of smaller divisions of lands (*`ili*), suggest that Maunalua was not a place of high-status residents.

B. The Project Area at Koko Crater

Introduction

Koko Crater is within the boundaries of Koko Head Park, a City and County of Honolulu park. The park also includes Koko Head around Hanauma Bay, the Halona Point Blow Hole and the western portion of Sandy Beach.

The project proposes to use Koko Crater as a water storage facility needed for the hydroelectric power plant. A subsurface pipeline will connect the facility to a switch yard and control office to be located near the Sewage Treatment Plant (STP) (Fig. 1).

Environment

Koko Crater is one of several volcanic tuff cones along the southeastern coast of O`ahu (Stearns & Vaksvik 1935:150). The soil within the crater are well-drained soils "developed in alluvium washed from deposits of volcanic ash, cinder and tuff" (Foote et al 1972:72). Its slopes are exposed rock. The area receives about 3 inches (800mm) of rain annually (Giambelluca et al 1986:73).

The crater was not visited. However, at the base of the eastern slope, the vegetation consisted of kiawe, koa haole, finger grass, pili, and other exotics. The section closest to the highway is in tall grass but once past that, the grasses are shorter and not so dense that it is easier to walk through.

Historic Site Information

The crater is a traditional cultural place. Its Hawaiian name as Kohelepelepe. "When Kamapua`a [pig god] attacked Pele near Kalapana, Kapo [Pele's sister] sent her [Pele's] kohe (vagina) as a lure and he left Pele and followed the kohe lele (traveling vagina) as far as Koko Head on Oahu, where it rested upon the hill, leaving an impression to this day. . ." (Beckwith in Sterling & Summers 1978:267).

Community informants told of sites on the interior upper slopes of Koko Crater (pers comm Tom Dye). The project area has not undergone archaeological survey.

McAllister recorded a series of seven agricultural terraces and a probable house site (site 37) on the low northeastern ridge of Koko Crater (1933:65). No surface sites were noted on the southwestern slope by Kennedy in 1987 at the site of the Hawaii Job Corps Center. Human burials have been found on the eastern upper slopes by hikers in 1989 (Kawachi & McEldowney 1989).

The author and Mr. Yuzawa started just west of the Sandy Beach entrance and checked part of the seaward exit of the project area. This was far from a complete survey. Low retaining walls near gullies and large boulders were observed. These were likely temporary habitation terraces as it is directly inland of the sandy beach.

Summary

Very little has been written about the proposed project area. An archaeological survey is needed within the crater and along the seaward exit to determine whether significant archaeological sites are present. It is not likely that habitation or agricultural sites would be found on the crater floor. It is likely, however, that burials might be found on the interior slopes and the crater floor. However, the crater is a traditional cultural place associated with Pele accounts.

IV. SUMMARY AND DISCUSSION

In Maunawili Valley, sixty percent of the proposed project site still needs to be surveyed. Agricultural and possibly temporary habitation sites are likely to be found. The floor of Ka`au Crater has not been archaeologically surveyed but the crater is a traditional cultural place. Few archaeological sites are anticipated as this crater is beyond the agricultural and housing zones of Palolo `ili. Koko Crater also has had no archaeological survey. Limited archival work indicates burials and a low density of habitation and agricultural sites are on its exterior slope, and sites might be found inside. This crater is also a traditional cultural place.

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